SCORM 2.0: Perspective and Background
This module provides a perspective on the current state of play in relation to
learning technology standards in general and in particular for SCORM 1.x
which has become a default 'standard' for many learning education and
training communities. It was originally written as an introductory section to
SCORM 2.0: Learning in the Mainstream.

SCORM 2.0: Perspective and Background

SCORM is often referred to as the 'de facto' standard for learning content.
There is little question that it has provided immense utility to learning
communities globally. It was conceived, however, at a time when the core
issues for technology supported learning were very different to the ones that
Learning, Education and Training (LET) communities currently face.
SCORM and the specifications and standards from which the profile is
constituted were developed in response to the need to achieve portability of
courses between Learning Management Systems; a 'mono-dimensional'
separation of packaged content from its delivery. Possibly as a result of this,
SCORM implementations have typically resulted in single-user, self-paced
online instruction instead of more creative models.

While there is still some value in that objective, the scope of what needs to
be achieved and the issues that have become the focus of learning
communities in education, government, corporate and defense sectors are
now very much broader than purely content aggregation, portability and
sequencing. There is evidence that the new requirements for SCORM 2.0
are already being considered with the broader scope in mind (See SCORM
2.0 Home on LETSI and related documents and communities available at
that site), so this is just one additional perspective on both the functionality
and boundaries that might be considered for SCORM 2.0.

During the period in which SCORM has been available for implementation
there have been a number of significant changes in relation to content,
infrastructure and the commonly available web-based applications. The sum
of these changes would make it nonsensical to redevelop SCORM as it has
existed in version 1.x. The emergence of concepts and technologies
characterized as "Web 2.0"[footnote] have impacted many of the

communication and interaction models on the web. It is now commonplace for LET discussions to focus on the use of Web 2.0 technologies in learning, and this in itself, drives a change in scope from that of SCORM 1.x. In a recent presentation to [LearnX](#) 2008 in Melbourne, Professor Nigel Paine proposed five key shifts that would impact learning, education and training. He described them as the shifts from:

While there is definitely hype associated with the term Web 2.0 and debate about the validity given the reliance Web 1.0 technology. Since the beginning of the web it has always been possible for individuals to form communities, share content become individual publishers. Nonetheless, the way [Web 2.0 is described by O'Reilly](#) at does provide a basis for understanding the value rather than the hype.

Courses	to	Environments
Delivered Knowledge	to	Shared Knowledge
Control	to	Free Flow
Individuals	to	Communities
Skills [alone]	to	Values and attitudes [as equals to skills]

Slides available [here](#).

These shifts have significant implications for any standard intended to satisfy the needs of LET communities into the future[footnote]. We also need to be quite clear about the role of SCORM in learning (ie what it should enable), and remain clear about those things that should be outside of the scope of SCORM.

A somewhat similar perspective has also been written by Elena Benito Ruiz in her blog E|FL 2.0. While these perspectives represent a substantially different set of needs to those of compliance training and the needs of, for example, military and aerospace sectors, LETSI states that it wants to serve all learning communities. This is a language and 2.0 way of thinking about infrastructure for learning.

We tend to see the requirements of SCORM 2.0 from the perspective of the sector, organization or part of the LET community(ies) to which we belong, and thus, as a group or collection of extended communities, are likely to exhibit differences in what we hold most important. The technical description, or standard, of SCORM 2.0 needs to cross these boundaries of thought and be useful to LET communities in general. When considering the scope and role of SCORM 2.0 we need to be aware of how different the extremes in our spectrum of communities actually are, and do our best to accommodate as much as we are able. For instance, we could juxtapose the regulatory training requirements that span a variety of training communities (eg defense or aerospace) to some of the issues of openness expressed by Martin Weller of the Open University, UK in his blog, "No Good Reason" (view categories such as "openness" or "Open Content"), or on the Open Content blog written by David Wiley who has been an active researcher and writer in the area of instructional design, learning objects and openness in education. It should be noted that this paper has sought to give examples and place some level of emphasis on the needs of LET communities and jurisdictions that have not traditionally participated as actively in SCORM development in the past, even though the ADL has always been interested in such participation. An objective of this paper is to encourage thought and action for those communities whose needs have been less well represented in SCORM 1.x.

Much of the emphasis of SCORM has been at the regulatory and programmatic training end of the spectrum. While there is no shortage of instances where it has been used at various levels of education that begin to move towards the other end of the spectrum, it has been more complex to implement SCORM to support such goals. The education sector is changing as a result of trends in technology and the needs of its stakeholders. As individuals involved in this SCORM redevelopment process it is probably

worth spending some time to ensure that we are aware of the full spectrum of need with which we are dealing. Some references that may assist are:

- A publicly accessible excerpt of *Web 2.0: New Tools New Schools* by Gwen Solomon and Lynne Schrum (2007) is available online. It includes the Educational Technology Standards for Teachers, the implications of which are also worthy of consideration.
- Alan Blinder, Professor of Economics at Princeton University in his 2007 contribution to the Forum on the Future of Higher Education titled PREPARING AMERICAS WORKFORCE: Are we Looking in the Rearview Mirror? makes the point that "over the next generation, the kind of education our young people receive may prove to be more important than how much education they receive." (This has also been quoted as "how we educate our children may prove to be more important than how much we educate them" by Friedman in The World is Flat.)

The objective in the perspective provided so far is not to decouple SCORM from its history, but rather, to support the LETSI objective that its work should be consistent with the needs of learning, education and training across all sectors. SCORM could be an important part of meeting those needs through the liberation of content across all manner of boundaries.

During the period in which SCORM has been available for implementation there have been a number of significant changes in relation to content, infrastructure and the commonly available web-based applications. The sum of these changes would make it nonsensical to redevelop SCORM as it has existed in version 1.x. The emergence of concepts and technologies characterized as "Web 2.0" have impacted many of the communication and interaction models on the web. It is now commonplace for LET discussions to focus on the use of Web 2.0 technologies in learning, and this in itself, drives a change in scope from that of SCORM 1.x. In a recent presentation to LearnX 2008 (www.learnx.net) in Melbourne, Professor Nigel Paine proposed five key shifts that would impact learning, education and training. He described them as the shifts from:

SCORM 2.0: Setting the Boundaries
This module discusses the boundaries that apply to SCORM in terms of its functionality. This module is part of the SCORM 2.0 collection and was originally written as a section of the document titled SCORM 2.0: Learning in the Mainstream.

SCORM 2.0: Setting the Boundaries

At a conceptual level the role of SCORM is to provide:

- a way to aggregate content in a structured manner and make it available to a user in a way that is intended to assist them developing actionable knowledge;
- support for the high-level functionalities[footnote]; and,
  The high-level functionalities are defined in SCORM 2004 3rd Edition Overview Section 1.2.1. They are defined as Accessibility, Adaptability, Affordability, Durability, Interoperability and Reusability and are often referred to as the "ilities".
- support for rule-based sequencing of content. (LETSI states that this functionality may not be present in the first version of SCORM 2.0.)

It may be argued that support for data exchange with related systems in learning infrastructures should be better supported. This would include support for integration with a range of repositories for competency data, ePortfolios, learner profiles etc. The exchange and useful consumption of what is essentially metadata from these types of repositories is likely to be an important issue for holistic, service-orientated infrastructures. Not all of these data interchange requirements sit entirely within the role of SCORM, however, appropriate support will be critical to success.

Highly regulated views of training are evident in the requirements expressed by defense, aerospace, medical and pharmaceutical industries, food safety, workplace safety and a variety of others. In terms of the diversity of learning, education and training, these requirements may be seen to sit at one end of a spectrum where activities are tightly controlled and highly regulated. The following are a small set of examples of perspectives across these different industry sectors:

a. MedBiquitous requirements for the health sector (see [slides](#));
b. Compliance Training in the Banking Sector (see [article](#)); and,
c. an elaboration of training requirements (see [example](#)).

By contrast, some parts of the education sector and those involved in the recognition of informal learning are often more interested in more open and less controlled approaches to learning. David Wiley presents an [open education view](#) that argues the lack of utility and difficulty in adopting SCORM in [higher education] learning. It is worth considering what this means for the boundaries and role of SCORM.

There is growing emphasis on the possibilities whereby learners establish some type of Personal Learning Environment or "PLE" (eg [SocialLearn at the Open University UK](#)). It is possible to actually create various types of mashups that provide a single interface to a PLE, however, this is not within the technical confidence levels of the average user. If PLE's persist and evolve they are likely to become simpler for the average user to create and more standards driven. There is no apparent reason why SCORM should be 'the' standard for such mashups, however, there is likely to be considerable value with higher levels of interoperability, reusability and device-independence of the content available for such mashups.

Given these basic perspectives, SCORM should continue to be concerned with the 'ilities', however, within the context of a broader suite of applications that offer functionality designed to support learning rather than just LMSs. It is also important to consider a broader definition of reuse where learning content is liberated from purpose-built LET technologies alone in favour of being mainstreamed within organizations. Rather than being treated as a separate body of content locked away in applications unable to participate in 'single source publishing' models the content is liberated for reuse according to need. Within the context of this overall shift, it is probably worth revisiting the "high-level functionalities" to be supported by SCORM and determine whether adding new content-based functionalities is also appropriate (eg sustainability, scalability, composability, 'syndicatability').

SCORM 2.0: Problem Scope
This module discusses the scope that should be addressed by SCORM 2.0. This module was originally created as a section of the SCORM 2.0: Learning in the Mainstream paper submitted to LETSI prior to the SCORM 2 Workshop in Pensacola, Florida in October 2008.

SCORM 2.0: Problem Scope

In the following sections a number of key issues are highlighted and their requirements elaborated. At the outset, and for context, the following perspective is a guiding principle in what is presented. SCORM has always been an educational technology standard that has sought to remain agnostic to pedagogy (after all, its focus is upon content). While additional support may be possible for good practice, SCORM should remain agnostic to pedagogy and andragogy and should not enforce any particular approach to the access of content for the purposes of supporting learning. Individuals and organizations should remain free to choose the optimal learning, education or training approach(es).

The following are the main components upon which this paper will focus prior to proposing a solution: (a) True Interoperability, (b) Reusability in an organization-wide context, (c) The need for a structured content model, (d) Implications of service-orientated approaches, (e) Granularity, aggregation, independence and rendering, (f) Smooth transition between current and future SCORM, (g) Accommodation of new approaches to LET, (h) Metadata, CORDRA and syndication, and (i) Cross-domain scripting.

a. True Interoperability

The level of interoperability that is most frequently available in SCORM 1.x (especially 1.3.x or SCORM 2004) may best be described as partial interoperability. Many vendors have sought to make the creation of SCORM 2004 content simpler for course developers. As a result, achieving adaptability and interoperability at the same time is not normally possible without being limited to the tools of a single vendor for assembly, maintenance and adaptation. This is due to the use of wizard-like authoring/assembly tools that add proprietary scripts

for aspects of sequencing and navigation. While it has been important for vendors to simplify the course development process, there has been a negative impact on interoperability.

For the most part, it is possible to upload packaged SCORM-conformant courses into a SCORM conformant LMS and run the course. The course will launch and exchange data with the LMS as required. If, however, there is a desire to adapt the course, then this must generally be done using the same tools with which that course was originally created. In the case of 'true interoperability' it should be possible for content to be both interoperable at the level where courses are consumed 'as is' by LMS-type applications and yet are also adaptable by tools other than those used in the original creation. It should be possible to change the most granular parts of a course, reorganize the content, alter the organizations within a course or change their sequence and sequencing rules in applications other than those in which the course was originally created.

True interoperability should be an objective of SCORM 2.0.
b. Reusability in an organization-wide context

Originally SCORM (and the specifications from which it was constituted) was focused on the ability to exchange courses between LMSs. In that original time and context this was an entirely appropriate goal, and one that required significant effort to achieve. In the current context, however, there has been an increasing focus on the reuse of content beyond the domain of LET alone. Initiatives such as S1000D and SCORM alignment in the aerospace and military sectors have sought to bring content that was not originally training content into the training domain. Similar activities are evident from corporate sector under the banner of "Single Sourcing" or "Single Source Publishing". (A useful paper by Jim Nugent is available [here](#).)

One of the obstacles currently faced by online learning is that it has largely become divorced from the rest of the content in organizations. It requires different tools that create and deliver content that is often limited to the LET domain. Content that supports LET objectives should be useful more broadly across the organization in areas such as

decision support, online help, marketing, print-based communications, mobile devices etc. It should also be possible to source LET content from other parts of an organization or its business partners.

The notion of creating course aggregations from content other than content specifically created for or by LET applications (eg LMSs and/or authoring and assembly tools) has not been possible without significant effort, changes and duplication of content across organizations and/or their business partners. While there are both infrastructure and content issues at play, the inhibitors resulting from the current versions of SCORM should be removed or LET content and infrastructure will always be seen as an external 'add-on' to the core business.

Organization-wide reusability of content should be an objective of SCORM 2.0.

c. The need for structured content

SCORM has long been in need of a structured content approach that would support delivery of content to a variety of devices and applications without the need to provide such services outside the context of SCORM itself or in a proprietary manner. The inclusion of a structured content model within SCORM would also be a key factor in satisfying the objectives of (a) and (b) described above. In addition, a standard that involves a structured content model will better provide for both the current and future needs of LET communities and would be a key component of bringing the LET functions of an organization back into the mainstream.

It is not likely to be worthwhile or timely to consider developing a new structured content model for SCORM. More importantly this would tend to impede progress towards the achievement of organization-wide reuse as described in (b). There are already a number of potentially suitable structured content standards and/or architectures that are likely to satisfy the requirements LET communities may have for learning content. Where existing standards are not able to fully satisfy the requirements, they may be adapted over time.

Incorporating a structured content model within SCORM should be an objective of SCORM 2.0.

d. Implications of service-orientated approaches

Service-orientated approaches fundamentally "change the game" in relation to content and metadata. Using multiple applications to provide a service-orientated approach for LET functions is characteristically different to that of using a single monolithic application (eg LMS or Course Management System). In a service-orientated approach a number of different, loosely-coupled applications provide functionality in the form of services that are exposed to the user through an appropriate interface. (The result of this approach would be a Service-orientated Architecture (SOA)). The e-Framework project continues to provide a wide range of resources to support this approach. During the design stage the range of services and supporting applications would be defined.

Given the range of possibilities in this type of approach, it is increasingly likely that a larger number of applications would be involved in various aspects of the content lifecycle. This in itself forces change in the way we consider reusability and interoperability of content where the primary mode of access may or may not be a Learning Management System, and the purpose for access of that content may vary between performance support, decision support, online help, learning, education, training etc. In addition, if the issues raised in items (a), (b) and (c) are included, it would stand to reason that multiple applications (or services) may access the same content for different purposes and possibly, simultaneously. This model contains implications for: the granularity of content and how it is stored and managed; the purposes and levels of aggregation of content; and, the structure of the content. It should also be noted that the content may also be accessed from different devices that provide features related to mobility and accessibility (in the sense of W3C Web Accessibility).

Within this context there should also be an awareness of the implications of distributing functions across services and applications,

and ultimately their reliance on different types of content, data and metadata repositories. The metadata that describes a learner are more likely to be stored in dedicated but far more independent and possibly distributed repositories that can be accessed by multiple applications for a variety of inter-related purposes. Such uses may include, for example, metadata concerning competence, work history, course progress, career management (internal and perhaps external), accessibility/disability, etc. SOAs will tend to rely more heavily on distributed metadata that would assist the variety of applications within a system to control the 'what and how' of content access and rendering as well as improvements in the discovery and reuse. These requirements would imply a different type of focus on the exchange of data and metadata associated with content and users within a service-orientated infrastructure. Awareness and support for these approaches will be critical to the utility and successful implementation of the next generation of SCORM.

Accommodating the broad range of requirements resulting from service-oriented approaches should be an objective of SCORM 2.0.
e. Granularity, aggregation, independence and rendering

Several of the previous sections have already suggested requirements for structured content, support for service-oriented approaches and the same content being accessed by a variety of different application types for different purposes, and that of 'true interoperability'. This section will argue that the result of the previous sections requires us to think differently about granularity, aggregation, content independence and rendering (amongst other factors). If one accepts the utility of being able to reuse content across organizational boundaries and requirements (training, marketing, tech docs, EPSS etc) then it suggests that not only is it necessary to move towards a structured content model, but it is also necessary to be flexible in the way that granular content assets are combined to create a meaningful experience within a particular context. For example, one may wish to use some of the technical specifications of a product in marketing brochures or combine them different sequences or aggregations for training or

within different courses, or provide access to the unique components for EPSS.

These types of scenarios are by no means new (cf S1000D-SCORM alignment; single source publishing etc). Where these requirements exist it is common to use a structured content model so that authoring and aggregation are separated from processing and rendering thereby allowing for content transformation. A structured content architecture provides the flexibility to engage in a single sourcing approach.

In approaches such as this, the range of uses and combinations of granular content is not necessarily known at the time of content authoring, therefore, it is also important to be able to work with different levels of aggregation as well as being able to create or edit aggregations for different purposes. An additional level of utility is achieved by enabling the linking of smaller aggregations of content to form larger aggregations of content. (An example would be reusing 'Virtual Learning Objects'[footnote] across different courses or outside the context of any form of sequenced, course-based activity) Of course, logic and suitability will naturally apply some constraints on the extent to which content and aggregations are reused.

In 2005 the author coined the term Virtual Learning Object to describe the concept of creating dynamic links of granular content to a manifest file and then linking that manifest to a 'parent' manifest. In this approach the 'child' manifest may be used to describe the content of a learning object but because the content is linked and not packaged it becomes 'virtualized', hence it becomes a Virtual Learning Object.

On the one hand, the implication for content is in some ways no different than it always has been where reusability has been an objective. Content must be developed for reuse. On the other hand, there is an added dimension because the reuse context could be substantially different. This places a higher premium on the independence of content.

The European Learning Industry Group (ELIG,), is recognized as the major EU association "representing the ecosystem for 21st century learning solutions". It acts as the main consultation body for the

European Commission concerning future learning industry trends. The Chair of ELIG, Fabrizio Cardinali, recently announced the establishment of new, dedicated work streams within ELIG to better focus and support the requirements of the European Publishing Industry in its move towards innovative technical, architectural and business solutions. According to Cardinali, "these ELIG work streams are intended to better support the increasing pressure from the users for open and flexible content, emulating what happened in the digital music publishing Industry in its turn towards single-tunes-based business models at the beginning of the millennium[footnote]." Again, the suggestion of educational publishing to accommodate smaller aggregations of content rather than entire textbooks and the ability to reuse such content within the context of different educational activities also suggests a structured content model with new levels of support for granularity, aggregation, independence and rendering.

A dedicated workshop on "Digital Educational Content Marketplaces" (DECOM 2008) has been announced by ELIG and will take place in Italy in October 2008 (For details visit the DECOM 2008 site.)

The use of an appropriate structured content architecture can allow for all of the requirements described in this section as well as the ability to render the content in different ways for different uses, and indeed, different devices, applications etc.

The ability to aggregate structured content at different levels and transform or render that content according to the context of its use should be an objective of SCORM 2.0.

f. Smooth transition between current and future SCORM

Any change to SCORM will cause some measure of disruption throughout the cycles of both content and technology. It is important to soften the impact of such a change as much as reasonably possible. The extent to which disruption will occur and the ability to soften such impact is very much dependent upon the composition of SCORM 2.0.

Taking reasonable steps to minimize the impact of changes to SCORM should be an objective of SCORM 2.0, however, future benefit should take priority.

g. Accommodation of new approaches to LET (including instructional design objectives)

At the beginning of this section it was stated that SCORM should remain pedagogy/andragogy neutral. The perspective in this section attempts to define a little more clearly that boundary between technology and support of good practice.

In the past it may have been misinterpreted that being pedagogy neutral also meant that there was little or no work to be done in supporting 'good practice' (good? better? best? different? appropriate? etc – pick all that apply...) in teaching and learning. An opposite view is proposed here. While SCORM should not dictate any particular pedagogical approach, it should, nonetheless, provide adequate support for a variety of pedagogical/andragogical approaches. At risk of this seeming to be an insurmountable task, some further comments on the role of SCORM in this approach will be provided. The key messages may be stated as:

  i. SCORM should provide useful structures to support different approaches to teaching and learning but not enforce any particular method.
  ii. SCORM should not be seen as 'elitist'. If the simplest and possibly mechanistic approaches to teaching and learning are all that an individual or organization can achieve, then they should not be precluded from capturing the broader benefits of standards-based content. Hopefully, over time and with improved tools it will be easier for more learning content to be developed in line with an appropriate definition of good practice.

The LETSI [Teaching and Learning Strategies Workgroup](#) has provided a thoughtful outline of the sort of practices and requirements that are likely to need support from SCORM 2.0. It seems likely that the efforts of that group will result in refinement of the existing requirements and the addition of new requirements as work progresses. Due to the scale of their task, it is unlikely that the work of that group will be 'complete' before the end of 2008 when a decision on the composition of SCORM as the base for the future is scheduled to be made. Even if

their work was complete, that should be regarded as a temporary status. There will continue to be new approaches to andragogy and pedagogy that are both supported or challenged by technology. This should re-stimulate the question concerning the scope of SCORM.

In the past SCORM has been about the aggregation and sequencing of [primarily] packaged courses and the ability to deploy them to multiple Learning Management Systems or Course Management Systems. The premise was that an LMS or CMS would provide all the functionality required for web-based course delivery. By contrast, many of those involved in Web 2.0 learning would question the value of an LMS or CMS for any of their requirements. In reality, these exist as the two opposite ends of a spectrum of requirements for the role of learning technology and standards supporting learning (including training).

Possibly the biggest difference between the requirements of the past and those from now into the future from the technology side is that there is a far greater likelihood of a larger number of applications with very different functionality accessing [the same] content and metadata from a larger number of sources than in the older models. From the human stakeholder perspective we could draw upon Nigel Paine's "5 Key Shifts" and say that while in some situations courses will continue to be delivered to an individual under tight control and primarily for the acquisition of skills, the shift is towards the creation of environments for the free-flow sharing of knowledge among communities to support changes in values and attitudes as well as the acquisition of actionable knowledge.

SCORM should not be about method (ie how to facilitate learning), it should be about liberating content and making it available (existing or created as part of learning) to a broad set of applications so that any learning method may be supported.

Currently we are sorting through the issues and challenges posed by requirements to support collaborative learning, social learning, Open Education Resources, discovery learning, adaptive content, immersive experiences, simulations and the impact of these challenges on learning content. In the future, a new set of challenges will emerge

along with a new set of applications to support them. SCORM should both support and survive these challenges. Of course, the levels of success are dependent not only upon SCORM itself, but how it is implemented at both the application level and the system level.

Supporting the different ways for accessing, adapting or creating content in the context of new models for learning and training should be an objective for SCORM 2.0.

h. Metadata, CORDRA and syndication

While the IEEE LOM (LOM) metadata has become the default schema for describing learning content, it is also widely accepted that it is no longer adequate. Reliance on LOM alone would prove to be of very limited value in the context of enterprise-wide content reuse. Thinking about metadata has moved on considerably since the creation of LOM and it is now important to revisit metadata in the context of the issues presented here and those raised through the existing work on complimentary architectures such as the Content Object Repository Discovery and Registration/Resolution Architecture (CORDRA). In addition, it is important to consider that SCORM and CORDRA may also need to be aware of other types of related metadata (competencies, profiles, etc) and that these may need to be factored in to the overall design.

While work on CORDRA has been undertaken at ADL with related agencies, content syndication using standards such as RSS has proliferated widely across the web. In some cases this is seen as an alternative to some CORDRA-like functions, however, it may be more useful to consider RSS as complimentary to CORDRA's objectives. Enabling a comprehensive set of syndication functions related to learning content and repositories may also require some consideration of these needs within the composition of SCORM.

Revision of the approach and schemes used for metadata and support for content syndication should be an objective of SCORM 2.0.

i. Cross-domain scripting

The cross-domain scripting issue has been a pain point in SCORM for anyone dynamically aggregating content from distributed repositories for delivery via SCORM conformant applications such as LMSs. A range of alternative approaches is possible and the need to find such alternatives increases as service-orientated approaches become more widely deployed within infrastructures to support learning activities. The problem needs to be resolved. (The content of this paper will not make any contribution to solving this issue.)

Solving the cross-domain scripting issue should be an objective of SCORM 2.0.

Use Cases and Stakeholders
This module comments briefly on the Use Cases and Stakeholders of a possible next generation of SCORM. It was written as a section of an original document titled, SCORM 2.0: Learning in the Mainstream and was submitted to LETSI for consideration in their SCORM 2.0 project and the SCORM 2.0 Workshop in Pensacola, Florida in October 2008.

Use Cases

Due to the approach of this paper there is little value in attempting to provide a range of use cases because it would be impractical to cover the entire spectrum of what has been discussed. Aside from addressing specific issues in relation to requirements for SCORM 2.0, the fundamental proposition of this paper is to advocate that SCORM should enable participation in a single sourcing approach and thereby assist in mainstreaming learning content, services and applications. Appendix 1 contains some relevant scenarios in support of the perspective of this paper.

Stakeholders

In the case of this Whitepaper the stakeholders may be stated as "those communities interested and involved in the development of content and infrastructures for learning, education and training".

This paper is a position paper that is focused on a 'solution architecture' approach to designing a "next generation SCORM". LETSI is concerned with all learning, education and training communities, and therefore, the stakeholders for a new approach to high-level functionalities for learning technology infrastructure, content and processes may be defined in equally broad terms.

SCORM 2.01 Experiment on OER
This module discusses a proposed solution for SCORM 2.0 and its ability to satisfy a defined set of issues. It was written as a section of an original document titled, SCORM 2.0: Learning in the Mainstream and was submitted to LETSI for consideration in their SCORM 2.0 project and the SCORM 2.0 Workshop in Pensacola, Florida in October 2008.

SCORM 2.0: Proposed Solution

SCORM will never solve all the problems associated with learning, education or training. As the acronym clearly states, it is primarily about the sharing of content objects [in training and education – implied]. It has been argued in this paper that the previous focus of SCORM, while appropriate for the time at which it was conceived, is now too narrow and has suffered from some problems that cannot be resolved without an approach that includes a structured content model together with flexible levels of aggregation. (It should be noted that IMS Global has also moved to an approach that enables levels of aggregation in the Content Packaging v1.2 specification.) Irrespective of the structure and composition of the next generation of SCORM, there will continue to be a requirement to allow flexibility in the implementation. That will always mean that implementation choices will affect the levels of interoperability, reuse, adaptability etc, however, hopefully less so in a new model than in the past.

The requirements and solutions proposed in this paper are not intended to be comprehensive. This paper will not propose solutions to all of the issues raised within the scoping section. More specifically, the scope of the proposal may be tabulated as follows.

Capability	Scope Criteria

Capability	Scope Criteria
Yes	i. True Interoperability ii. Reusability in an organization-wide context iii. The need for a structured content model iv. Granularity, aggregation, independence and rendering v. Smooth transition between current and future SCORM
Partial*	i. Implications of service-orientated approaches ii. Accommodation of new approaches to LET iii. Metadata, CORDRA and syndication
No	i. Cross-domain scripting ii. Server-side scripting
*Subject also to implementation choices	

Potential of the Proposed Solution to Satisfy the Scope Criteria

The core of this proposal is to adopt an existing structured content model as part of SCORM. This paper is neutral to the reasons for LETSI seeking to implement a new content aggregation model for SCORM 2.0, rather it takes the approach that if this is necessary, then replacing the aggregation model alone does not provide sufficient value to warrant the effort or resulting impact across the LET communities, including vendors. LETSI's approach to gathering requirements tends to support this notion.

Given SCORM 2.0 deadlines published on the LETSI site, it is not feasible to develop a new structured content and aggregation model for SCORM.

This is also outside of the stated scope of work of LETSI. On that basis, an existing structured content and aggregation model needs to be selected for adoption. While several such standards exist, they are mostly quite narrow and industry specific in their focus and do not provide easy pathways for adoption into learning communities.

This paper proposes the Darwin Information Typing Architecture (DITA) as the standard for adoption into SCORM 2.0 because of its ability to provide solutions for the scoping issues (a), (b), (c), (e) and (f) together with its potential to provide partial or substantial assistance for issues (d), (g) and (h) (see the above table).

While DITA was first developed and introduced into IBM in March 2001 within IBM DeveloperWorks, the History of DITA traces the roots of the thinking behind DITA back to earlier than 1960. The evolution in thinking is of interest, however, it is the expression of that thinking in DITA as it was developed by IBM and then released to the Organization for the Advancement of Structured Information Standards (OASIS) that is more germane to this paper.

There are two issues worth noting about DITA from the outset. First, that it is conceptually similar (though not identical) to SCORM in that it focuses on the development of granular content items (topics) that are aggregated for processing and delivery to a consuming application. The aggregation model in DITA is richer than that of the current SCORM. Second, that while DITA was originally developed to satisfy technical writing requirements for technology products, it was always intended that specializations would evolve from the DITA core and that this would provide for industry or discipline specific variations. Provided the specializations are developed in a conformant manner, they will remain compatible with the core of DITA and will be processed successfully. The base structure of DITA provides a sort of safety net. Suffice to say that there are constraints concerning the processing of specializations but for the most part the system design performs very well. Currently, there are specializations completed or under development for the semi-conductor industry, machine industry, help documentation, enterprise business

documents, translation and learning. (See <u>DITA Subcommittees</u> for up-to-date details.)

In response to the issues outlined in the scoping section, DITA responds as follows:

a) True Interoperability

DITA's structured content model allows for true interoperability to be achieved. This is partly due to the validation of the content structure and partly through the ability to transform content of known structure and is reliant upon conformance.
b) Reusability in an organization-wide context

DITA's approach to specialization provides the ability to reuse content across organizational departments and functions. As with many standards, the implementation choices and content strategy have the potential to impact the realization of this objective.
c) The need for a structured content model

DITA is a standard for structured content.
e) Granularity, aggregation, independence and rendering

DITA is an XML application that enables content independence and dynamic rendering for single source publishing requirements. The approach to granularity and aggregation is very flexible and the separation of authoring and assembly from processing and delivery is also supportive of this objective.
f) Smooth transition between current and future SCORM

The development of the <u>DITA Learning Specialization</u> has a specific objective to provide processing support for SCORM 2004. This enables organizations to provide a soft transition from SCORM as it exists currently while providing the capability of moving to more advanced content development and single sourcing approaches. This will also ensure that content developers can shift to new and more desirable processes while vendors adjust to the new requirements of SCORM 2.0.

For those issues where this proposal is not intended to provide a complete solution, DITA responds as follows:

d) Implications of service-orientated approaches

A key factor in supporting this objective in the context of the issues outlined in this paper is that of storing and managing content in repositories (possibly multiple repositories) and then delivering that content to a variety of applications on demand. DITA is a structured content standard and so would allow for dynamic transformation according to the application requesting the content. DITA's support for single source publishing provides useful support for service-orientated approaches. The complete solution would go beyond what DITA is able to provide and include repository and content management issues, authentication and authorization, etc which are issues beyond the scope of SCORM and this White Paper.

g) Accommodation of new approaches to LET

It is important to separate the content issues from those of instructional design, application functionality and a host of other issues that need to be resolved in order to provide holistic solutions for new approaches to learning, education and training. DITA can provide a single sourcing approach that allows a variety of different applications that contribute different functionality in response to these requirements to use/reuse common content for different learning approaches. This is only part of the solution that needs to be provided, however, would represent an advance on what has been available previously. The concept is that of providing stores of content that may be accessed through applications that offer the appropriate functionalities to support a desired approach to learning or training.

h) Metadata, CORDRA and syndication

DITA provides a useful and robust approach to metadata, however, there are idiosyncrasies that relate to the original design of DITA that would most likely require some modification. Some of these issues have already been raised in the DITA Technical Committee and would benefit from input from the learning communities if DITA were adopted within SCORM 2.0. Even in the short term, the ability to more

easily provide a richer and more relevant metadata approach for learning content in DITA would deliver some immediate benefits. The DITA Learning Specialization already supports all of the IEEE LOM fields. An holistic approach to a content strategy together with metadata that is embedded (and later also associated) in the learning content would also better support automated extraction of metadata from the content and registration requirements within CORDRA federations and may contribute to enabling various forms of content syndication. Again, adoption of DITA is not a panacea for metadata issues. It would be assistive in the short term and with further participation from LET communities would be improved over time.

A complete model for SCORM 2.0 would require the inclusion of other standards and approaches to complete the functionalities as determined by the final requirements set. This proposal limits its approach to the content issues. There is nothing evident in this approach that would result in problems associated with satisfaction of whatever else SCORM 2.0 requires.

Integration and Technical Issues
This module discusses some of the technical and integration issues related to a new approach to SCORM. It was written as a section of an original document titled, SCORM 2.0: Learning in the Mainstream and was submitted to LETSI for consideration in their SCORM 2.0 project and the SCORM 2.0 Workshop in Pensacola, Florida in October 2008.

SCORM 2.0: Integration and Other Technical Issues

This proposal would not require integration as such. Some development effort would be required to enable a DITA native approach within applications designed to support learning activities. In the short term content can be dynamically transformed to be SCORM 2004 conformant and delivered through available applications. The development effort to support DITA natively is not necessarily a significant impediment. If SCORM were to continue with IMS Content Packaging as the aggregation format, vendors would ultimately be faced with migrating to CP 1.2 due to the improved value it provides through its manifest linking capability (ie the ability link to external, child manifests rather than incorporate them into the parent manifest). The bug fixes for CP 1.2 are also important to implement. This in itself means that there is a development requirement even if IMS CP remained within SCORM. Given these factors, adopting DITA is considered to have substantially greater value.

Another key consideration is that of vendor support for DITA. There are a growing number of tools that have DITA versions or implementations. Bob Doyle produced a review of these tools in April of 2008. The review was published for the Society for Technical Communication and so it necessarily is written from the technical writers' perspective, nonetheless, it provides a useful overview of both value and tools (The review is available from the DITA News site.). A simple web search retrieves a significant number of tools for authoring, storing and managing DITA content.

SCORM 2.0: Existing Implementations or Prototypes
This module briefly discusses early stage work that is related to the
SCORM 2.0 Proposed Solution. It was written as a section of an original
document titled, SCORM 2.0: Learning in the Mainstream and was
submitted to LETSI for consideration in their SCORM 2.0 project and the
SCORM 2.0 Workshop in Pensacola, Florida in October 2008.

SCORM 2.0: Existing Implementations or Prototypes

As stated in the Use Case section of this paper, the core proposition is to
shift from the existing approach where learning content is somewhat
isolated from other organizational content and generally locked away in
special purpose applications to a model where learning content is brought
back into the mainstream in the context of a single source publishing model.
There are many examples of the technical writing community moving
towards single sourcing and the trend is growing.

During the past 18 months the DITA Learning and Training Content
Specialization Subcommittee (DITA L&T SC) has been progressing
towards a set of deliverables to be incorporated into the release of DITA 1.2
which is due in the next few months. Progress in this area has now allowed
some activity to include the specialized requirements of learning content to
be included into single sourcing approaches. Prototypes of this work are
being undertaken by members of the DITA L&T SC.

SCORM 2.0: Conclusions and Acknowledgments
This module summarises the content of the paper and the proposed solution. It was written as a section of an original document titled, SCORM 2.0: Learning in the Mainstream and was submitted to LETSI for consideration in their SCORM 2.0 project and the SCORM 2.0 Workshop in Pensacola, Florida in October 2008.

SCORM 2.0: Summary and Recommendations

The decision to move to a new generation of SCORM is timely and significant. This paper is neutral to the issues that may have driven the decision to reconsider the composition of SCORM in terms of standards and specifications. If a change is to be made, then let it be made in a way that will bring substantial new value to the broadest possible base of LET communities in a way that is manageable in terms of effort and change. While SCORM has been very useful and has become regarded as the de facto standard for delivering interoperability, reusability, durability, adaptability, affordability and accessibility in learning content and technologies, a variety of issues that have affected the levels of success in relation to these high-level functionalities. This paper has briefly described these issues and proposed the adoption of DITA as an approach that would contribute strongly to resolving the issues listed.

More importantly, it has been proposed that the ability to bring learning content into the mainstream of organizational content would contribute strongly to the work of learning, education and training communities and enable them to participate effectively in the trend towards single source publishing. While the technical writing community have logically been leading the adoption of single sourcing, it is now time that the LET communities joined this trend and were able to both contribute to, and benefit from, this approach to content development.

The Educational Publishing Industry is being pressured by various initiatives to reduce costs of textbook materials and to find new business models, potentially similar to the music industry trend to tune-based sales. It is likely, however, that the business models will need to be richer and flexible in different ways to those of the music industry. IBM first

developed DITA because it needed to move away from book-based content models. The Educational Publishing Industry is already under similar pressure as a result of the emerging business challenges. A more synergistic alignment between publisher content and other learning materials and delivery applications would provide significant benefit to all key stakeholders. A common structured content format for SCORM and publisher content would add significant value to these objectives.

Finally, it is proposed that there is little to lose and a lot to gain from the adoption of DITA. Simply moving to an alternative aggregation specification or standard will do little to assist the future requirements and evolution of SCORM. Alternatively, moving to a standard that has both structured content and aggregation methods, supports single source publishing and the reuse of content across the enterprise, and in itself is already moving to support the requirements of learning, education and training is a move that holds many positive benefits for SCORM 2.0.

As a result the following recommendations are made:

i. That appropriate members of the OASIS DITA Technical Committee be invited to demonstrate the extent to which DITA is currently able to support the requirements for SCORM 2.0 and what opportunities exist for DITA to accommodate the evolution of SCORM.
ii. ii) That LETSI develop requirements for and work with interested parties to develop a short term pilot project as a test case for the adoption of DITA as the structured content architecture for SCORM 2.0.

Acknowledgments

SCORM 2.0: Appendix 1
This module is an appendix that highlights Use Case or Stakeholder issues not covered within the body of the original document. It was written as a section of an original document titled, SCORM 2.0: Learning in the Mainstream and was submitted to LETSI for consideration in their SCORM 2.0 project and the SCORM 2.0 Workshop in Pensacola, Florida in October 2008.

SCORM 2.0: Appendix 1

The focus of the paper SCORM 2.0: Learning in the Mainstream is to argue that a diverse range of communities require a different type of SCORM to that we have known so far. It would be impractical to try to provide a use case for the each of the possible examples. Instead a few links to projects or activities that provide examples of the requirements have been provided with some brief associated comments. These should also be considered together with the perspectives already provided in earlier sections.

i. Examples on the LETSI SCORM 2.0 FAQ page (available [here](#))

Each of the examples on this page has a potential to go beyond their current use of SCORM as a mechanism to upload the same course to different LMSs. In particular, the last two examples are important to consider. In the case of Chrysler/BBDO there was already a trend to reuse content originally developed by one department (eg marketing materials, technical specifications etc) as part of an aggregated course delivered to different audiences. Clever use of SCORM in its current format enabled a significant flexibility in the reuse of content. It was indicated at their presentation at Masie's Learning 2007 event that they were considering the added flexibility possible through structured content models and were interested to pursue the value of this approach.

ii. SociaLearn: Bridging the Gap between Web 2.0 and Higher Education (available [here](#))

Martin Weller's guest post on Michael Feldstein's eLiterate blog provides an interesting perspective on the challenges faced by Higher

Education. In particular, a few themes and/or comments are relevant. First, that the decentralisation of the monolithic LMS in favour of a suite of Web 2.0 tools is where the current trend is heading. In that context and with a goal driven approach to learning, the idea is to pull content, support and infrastructure together to allow the learner to orchestrate their progress. This is consistent with the scoping issues raised previously and their implications for content.

iii. Siemens and Just Systems Case Study

This case study will be familiar to many involved in the technical document and training alignment activities. While the training component is not mentioned until a minor reference in the conclusion, the theme and the objectives are in complete alignment with the focus of this whitepaper. It is a vendor Whitepaper and is well presented but with an obvious emphasis on the vendor's technology. Beyond that the content is very useful in providing a real world example.

iv. Multi-standard, single source publishing in the European Community

As a result of the ADL's S1000D – SCORM alignment activities, a range of vendors of have been focusing specifically in the area of single sourcing of authorized content within the context of documentation and training for defense and aerospace. As per the ELIG educational publishing workgroup cited earlier, single source publishing appears also as an emerging business trend for learning content management platform providers with an increasing interest for multi-device content generation and delivery. This would also include dynamic content aggregation, delivery and/or syndication from sources such as XML feeds, textbook repositories, web-based learning object repositories and editorial educational content etc. Single sourcing would enable the delivery of such content to traditional target applications, mobile devices or any number of newer applications to support learning and training.

The European Commission has launched a range of important research and development programs that are focused on developing technologies and practices for the future of learning and training "on the move and into the workspace". Two such projects that are of

interest to the focus of this paper are [Mobilearn](#) and [Wear it at Work](#). [Giunti Labs](#), recognised as a leading European provider of Learning Content Management Systems is involved in both Mobilearn and Wear it at Work. Giunti Labs is investigating the use of single source XML production for both technical and textbook documentation to be delivered in print, online and through handheld, location-based mobile delivery. As a result of their involvement with projects such as these, the need to provide single source publishing support has become increasingly evident. The perspective that emerges is that of structured content being stored and managed in digital content repository and marketplace technologies and being made available to a wide variety of consuming applications. It should ultimately be possible to embed, for example, S1000D, DocBook and DITA standards to enable single source content to support educational, maintenance, technical, textbook and learning content through multiple delivery streams.